Silver-Ion-Passivated Black Phosphorus Photodetector to Improve Response Time

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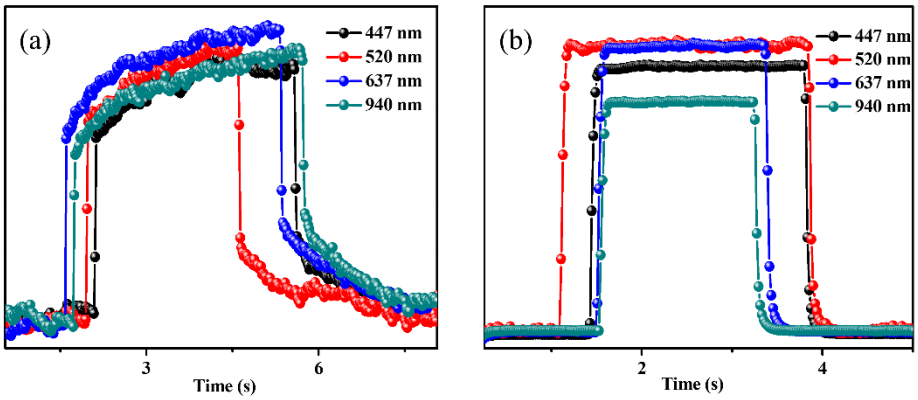

Figure S1. Transient response of as-prepared (a) and Ag+ decorated BP photodetector upon laser illumination at different wavelengths. It can be seen that the response time at each wavelength increases significantly.

Table 1 Comparison of different methods and performance to improve the stability of black phosphorus.

type	method	response time	hysteresis	mobility	Ref.
Gr-BP/Gr	covered hexagonal boron nitride (hBN)	t_r=1.8 ns, t_f= 1.68 ns	/	/	1
BP/MoS2/ arsenic-doped BP	encapsulated in hexagonal boron nitride (hBN)	t_r=35ns, t_f= 40ns	/	/	2
BP FET	dope with tellurium (Te)	/	/	1850cm^2 V^{-1} s^{-1}	3
BP FET	metal-ion-modified	/	/	1666cm^2 V^{-1} s^{-1}	4
BP FET	scalable superhydrophobic passivation layer	/	/	572cm^2 V^{-1} s^{-1}	5
Au/FL-BP based nano-devices	electrochemically deposited Au nanoparticles	t_r=47ms, t_f= 30ms	/	~45cm^2 V^{-1} s^{-1}	6
BP FET	SiO_2 passivation	/	/	524.3cm^2	7

				V^{-1} s^{-1}	
BP photodetector	Ag^+ passivation	t_r=50ms, t_f=80ms	from 85.6V to 29 V	844.12cm ^{2} V^{-1} s^{-1}	Our work

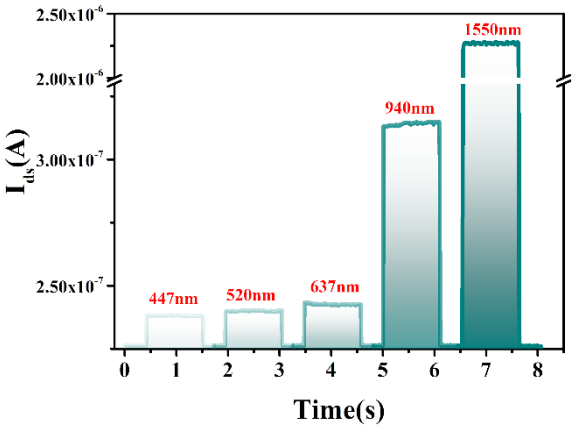

Figure S2. The response performance of a BP(Ag+) photodetector is measured when illuminated by a laser at wavelengths of 447 nm, 520 nm, 637 nm, 940 nm and 1550nm.

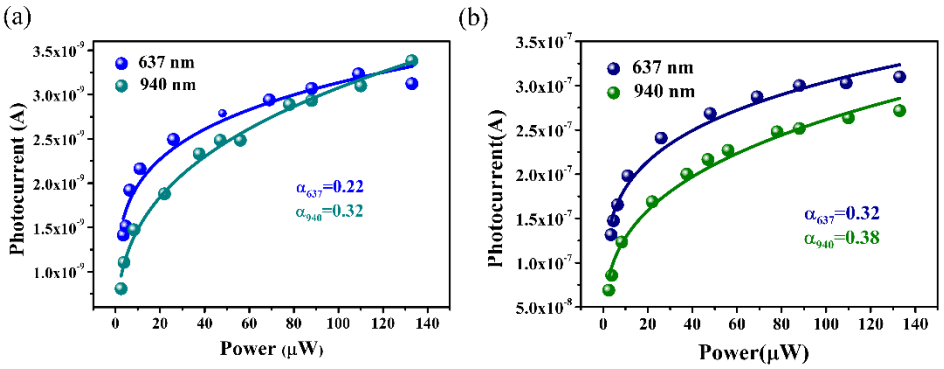

Figure S3. Photocurrent as a function of the light intensity for 637 nm and 940 nm before (a) and after $AgNO_3$ solution soaking (b). It was observed that for 637 nm laser, the coefficient of α increased from 0.22 to 0.32, and for 940 nm laser, the coefficient of α increased from 0.32 to 0.38.

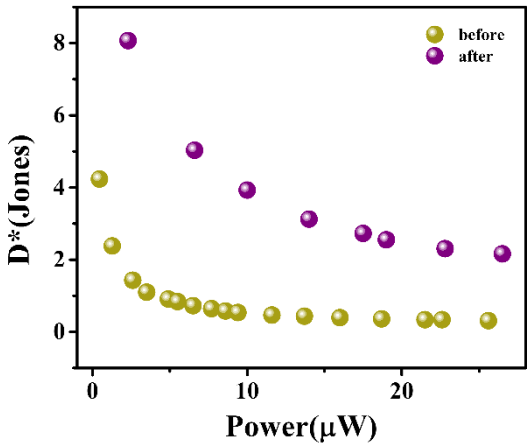

Figure S4. Dependence of the detectivity of the BP detector on the incident light power at 447 nm.

Reference

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